



Region 4 Biodiesel Workshop

Biodiesel Production and Fire Safety



Jason Allen
Fire Safety Engineer
Georgia State Fire Marshal's Office



What is Biodiesel?

Biodiesel is a non-fossil fuel and non-petrodiesel produced from animal fats and/or plant oils through a transesterification process.

In the world of fire safety, it is classified as a combustible liquid.

Key Terms

- Flash Point
- Flammable Liquid
- Combustible Liquid
- Fire Tetrahedron
- Fire

Flash Point

Minimum temperature at which enough vapors are given off from a liquid surface to form an ignitable mixture with air.

Flammable Liquid

A liquid that has a flash point below 100°F. Flammable liquids are further classified as Class IA, IB, and IC and are dependant on the flash point and boiling point characteristics.

Combustible Liquid

A liquid that has a flash point at or above 100°F. Combustible liquids are further classified as Class II, III-A, and III-B and are dependant on flash point characteristics.

Fire Tetrahedron

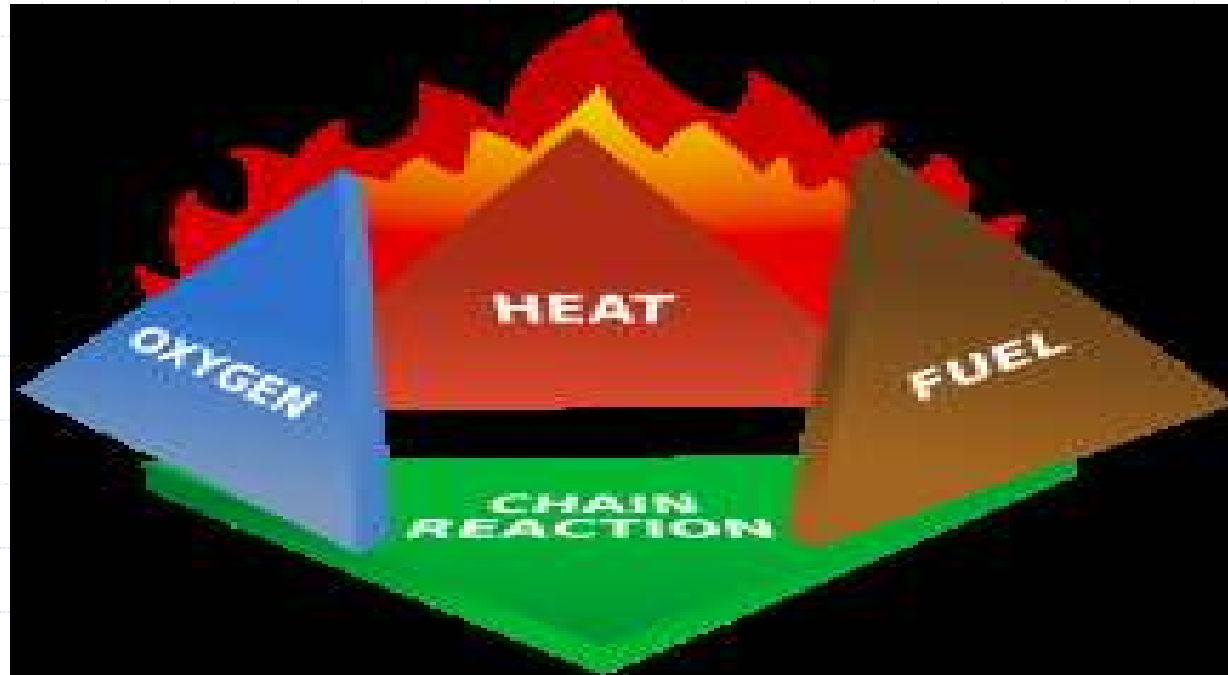
More commonly seen as a fire triangle:



Department of Public Safety, Park University

Fire Tetrahedron

Now we use the fire tetrahedron:



Department of Public Safety, Park University

Fire and Combustion Reaction

Fire is the rapid oxidation of combustible materials (including flammable and combustible liquids) that releases light, heat and combustion products.

This combustion reaction is why we can use biodiesel as a fuel.

Biodiesel Classification

Biodiesel (B-100) is a Class III-B liquid with a flash point around 266°F. Even though Biodiesel itself is relatively safe for use and storage, careful consideration and safety precautions must be taken in its manufacture.

Common Production Chemicals (Feedstock, Products, & Byproducts)

- Vegetable Oils/Animal Fats
- Lye (caustic soda)
- Sodium Methylate
- Sulfuric Acid
- Methanol
- Glycerine
- Biodiesel

Processes and Manufacturing

One of the first considerations that must be made when manufacturing biodiesel should be:

Where are we conducting our operations?

Processes and Manufacturing

Almost all Governments (whether State, County, or City) adopt in some form a building and fire code.

These codes can limit (and sometimes prohibit) the occupancy type and locations of chemical manufacturing.

Processes and Manufacturing

Always consult your building official and fire code official as to an acceptable (and safe) location for you operation.

Processes and Manufacturing

When storing chemicals, ensure that they are stored in approved containers and that materials being stored are compatible with the container.



Industrial Drum Equipment

Processes and Manufacturing

As an example, methanol (a class IB flammable liquid) shall be stored in grounded metal containers.

Plastic drums and containers can build up a static charge that could lead to ignition of vapors and result in a fire.

Processes and Manufacturing

Incompatible materials are required to be stored separately.

Cross contaminations could lead to hazardous products or even fires.

Processes and Manufacturing

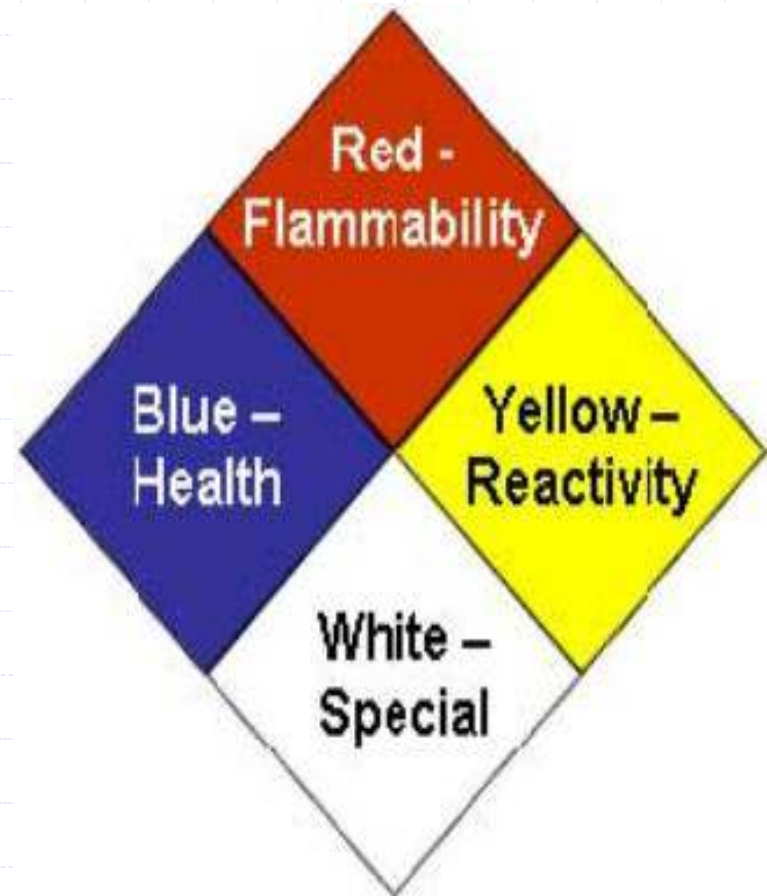
If there are questions about a chemical property, consult the Material Safety Data Sheets.



US Department of Energy

Processes and Manufacturing

All storage containers are required to have labels indicating the contents and shall also have an NFPA chemical hazard label indicating the hazards.



Federal Bureau of Investigations

Processes and Manufacturing

When producing biodiesel:

**KNOW YOUR PROCESSES AND
REACTIONS!**

Processes and Manufacturing

All persons involved in the biodiesel production process should be:

- familiar with the process
- trained in what to do in the event of an emergency

Processes and Manufacturing

Always be aware of the reaction byproducts and products that can be formed.

Some processes may give off flammable gases and vapors and may be exothermic (heat generating).

Remember the Fire Tetrahedron?

Processes and Manufacturing

If your operation does generate flammable vapors and gases, always make sure that they are vented to a safe location.

If your process is indoors, makes sure you vent outside the building and away from sources of ignition.

Processes and Manufacturing

All parts of the process also need to be reviewed to ensure that it is a closed process.

Any leaks or loose connections will allow for the release of liquids and vapors.

Processes and Manufacturing

All electrical systems and equipment within storage, transfer, and processing areas need to be reviewed to ensure that they are rated for hazardous areas.

Many fires have been started because the wrong type of electrical equipment was used.

Fire Protection Measures

All facilities are required to have basic fire and life safety measures:

- Fire extinguishers
- Sprinklers or Suppression systems (for indoor operations)
- Clear and unobstructed egress from processing/storage areas

Again, when planning a biodiesel production project, always consult your building and fire officials. They will be some of your best resources in designing a safe operation.

Incidents

June, 2006

New Plymouth, ID

A fatality due to a blast that occurred when a worker was reportedly welding on top of a tank containing soy oil.

Incidents

June, 2006

Canby, OR

A barn used to produce biodiesel was destroyed in a fire. The fire was thought to have started because of an electrical short.

Incidents

September, 2007

San Marcos, CA

A person was hospitalized after a fire broke out at a business that produced biodiesel. The fire was thought to be associated with the storage of chemicals used in the production of biodiesel.

Incidents

July, 2009
Chicago, IL

Two employees injured in an explosion at a biodiesel plant. There is speculation that an uncontrolled chemical reaction caused the explosion.

Incidents

September, 2009

St. Cloud, FL

A biodiesel plant was destroyed after an explosion and ensuing fire. Lighting was thought to have been the cause.



Questions?

Thanks!



Incident References

- http://www.cfnews13.com/News/Local/2009/9/24/biodiesel_plant_explodes.html
- [http://www.cfnews13.com/News/Local/2009/9/25/lightning to blame for biodiesel plant fire.html](http://www.cfnews13.com/News/Local/2009/9/25/lightning_to_blame_for_biodiesel_plant_fire.html)
- <http://www.clickorlando.com/news/21104858/detail.html>
- http://www.salem-news.com/articles/june242006/biodiesel_fire_62406.php
- http://www.portlandtribune.com/news/story.php?story_id=115223036291292200
- <http://www.idahostatesman.com/apps/pbcs.dll/article?AID=/20060707/NEWS01/60707023>
- <http://www.commongroundcommonsense.org/forums/lofiversion/index.php/t58965.html>
- <http://www.biodieselinvesting.com/biodiesel-archives/2007/09/10/person-hospitalized-from-biodiesel-fire/>
- <http://green.indy.com/posts/brewing-biodiesel-can-pose-fire-hazard>
- <http://risk-safety.com/biofuel-safety-is-it-time-for-bio-psm/>
- <http://risk-safety.com/explosion-at-biodiesel-plant-july-2009/>
- <http://www.reuters.com/article/domesticNews/idUSTRE56G63820090717>